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by George RANDOLPH



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A MECHANICAL
 ENQUIRY
 INTO THE
 NATURE, CAUSES,
 SEAT, AND CURE
 OF THE
 DIABETES.

With an Explication of the most
 Remarkable Symptoms.

Igitur hi, qui rationalem Medicinam profitentur, hæc necessaria esse proponunt: Abditarum & morbos continentium causarum notitiam, deinde Evidentium, post hæc etiam Naturalium actionum, novissime partium interiorum.

Rationalem quidem puto medicinam esse debere: instrui vero ab evidentibus. A. Corn. Cels. in præfat. lib. 1.

O X F O R D,

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S C A R C E any disorder has afforded greater matter of speculation, especially of late Years, than the *Diabetes*; yet the true *Rationale* of it is not so accurately understood, as to render a farther enquiry into its nature and causes, in order, if possible, to search out the reasons of the several Symptoms of it, useless or unnecessary. Amongst the Antients it was seldom heard of. *Aretæus* speaks of it, as something miraculous, θαῦμα τὸ διαβήναι πάθος, *Miraculum quoddam*: And *Galen* confesses, that in the course of his Practise he only saw two Pa-

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tients labouring under this complaint. The *uncommonness* of it might be owing to a different manner of Living, but the disorder was probably the same. For the description, which they give of it, in the most essential points agrees with that of the Moderns; it is true indeed, that most of them speak of liquor passing through the kidney not in the least chang'd, and make no mention of the sweetness of the Urine: But these are mistakes, which the colour of the Urine for want of accuracy, and observation, might be the cause of their falling into; for, as Dr. *Willis* observes, it always appears crude, and watry as of those labouring with the *Pica*, or with the Dropfy. Their Methods also of cure, which were rationally founded, and in most respects similar to the present practise, are a farther confirmation of this opinion. *Galen* made use of the following Medicines, as he himself testifies, to the great relief of his Patient. *Bol. Armen. Gum. Tragac. ---- Arab. ---- Mastich. Spodium. Sem. Endiv. ---- Portulac. &c.* and they seem to be well adapted to the removal of this disease, so far as they are known to strengthen weakn'd Solids, to sheath acrimonious humours, to incrassate too much attenuated blood, to abate hec tick fevers,

and

and to cool the body. But this will be farther consider'd in its proper place. It may not be improper, before we enter upon the enquiry, briefly to point out the opinions, which the Ancients and some of the Moderns entertain'd of this disease.

^a *Aretæus* suppos'd it to be a species of a Dropsy, ὕδρωσις ἰδὲν, and that it was owing to an Universal debility of body. For as in a Dropsy the solid parts of the body are dissolv'd into water, so in a *Diabetes* they are melted down into ^bUrine. But supposing such a waste of the body, and such a dissolution of the Solids, how comes it to pass, that they are dissolv'd into Urine? May not the humours arising from such a suppos'd decay, and wasting of the body tend to any other Viscus, as well as to the kidney? And seeing it is well known, that all fluids naturally tend to the weakest parts, is it not by far more reasonable to suppose, that they should be lodg'd either in the *Abdomen*, or *membrana cellulosa*, (being those parts of the bo-

^a De curat. Diabet. Lib. 2. c. 2. ^b Σαρκῶν καὶ μελέων
 ἐς' ἔξον ἢ ξωότηξιν ὕγρην καὶ ψυχρὴν, ὅπως ἐν ὕδρωσι αὐτῇ. ὅδε δὲ ἢ
 ξυνήθως νεφεριτὲ καὶ κύστις. De morb. diut. Lib. 2. c. 2.

dy, which give the least resistance,) and form dropfical fwellings, than be evacuated by Urine ? Such an Universal confumption then of the body does not feem to be the primary caufe of this difeafe, but may be, and is the confequence of it.

^a *Galen*, and his followers ^b differ'd from this opinion and thought it owing to an imbecility in the kidneys ; and fo far indeed they feem to have judg'd right : But then their manner of accounting for fuch a copious difcharge of Urine was very whimfical ; for they fuppos'd, that the humours contain'd in the feveral parts of the body were brought to the kidneys by an attractive power in them, and that the humours fo attracted quickly forc'd their exit out of the body. This account of it then fhews rather a fertility of imagina-

α Εμοὶ δὲ δοκοῦσιν οἱ νεφροὶ πεπονθέναι καὶ κατὰ τὸ τὸ πάθος.

— ὁρεξίντε ἅμα γίνεσθαι σφοδρὰν καὶ ἀφ' οὗτος ἔλκεν εἰς ἐαυτὸς ἀφ' τῆς κοιλῆς φλεβὸς τὸ ἔργον. De loc. affect. lib. sext. p. 4.

β Γίνεται δὲ ὁ ἀσθενείας δι' ἀσθενείαν τῆς ἐν τοῖς νεφροῖς κατεκπικῆς δυνάμεως, καὶ ἀφ' ὥσπερ τῆς ἐλκτικῆς, ἥτις ἀφ' ἐκτετακτοῦ ἀμετέστερον ἔλκεν ἀναγκάζεται ὁ μόνον τὰ ἐν φλεβῶν ἀλλὰ καὶ τὰ ἐν ὅλῳ σώματι ὑγρὰ.

Alexander Trallianus p. 150. to the same purpose speak *Oribasius*, *Paulus Aegineta* and *Ætius*.

tion,

tion, than solidity of reasoning. For the possibility of such an attraction is surely as difficult to be conceiv'd, as the cause of attraction itself. ^a *Avicenna* speaks of it much to the same purpose, and no wonder; seeing that the *Arabian* Physicians borrow'd their Systems of Physick from the *Greek*. *Aurelianus's* chapter upon this disease is lost: and ^b *Celsus* only lays down some general methods of cure to be observ'd, *cum Urina super portionum modum mingitur*.

A *Diabetes*, says ^c *Etmuller*, is either genuine, or spurious. The former is a voiding of liquors by Urine without undergoing any alteration in the body: The latter is a voiding of a much larger quantity of Urine than of liquids receiv'd into the body: The cause of the former, he thinks, is owing to a laxity and openness of the passages, which lead directly from the first passages to the kidneys. But these, he confesses, are not yet known, and no wonder; because it is evident from

^a *Et quandoque facit Diabetem potus aquæ frigida, aut obsessio vehemens frigoris in totum penetrantis, aut propter vehementiam attractivæ propter virtutem calidam — quare renes attrahunt ab hepate. P. 684. b Tom. prim. p. 234. c Tom. prim. p. 376.*

the nicest observations made in Anatomy, that there are no such passages leading directly to the kidneys, as he imagines, and therefore that no liquor can possibly arrive to the kidneys, but by first entering into the blood. To account for the latter, he supposes, a sharp acrimony in the blood, which resolves, attenuates, and melts down the blood, and even the muscular flesh itself into serum, which being thus melted down, stimulate the kidneys, and force their passage. But this account of it is so very strange and unphilosophical, that it will not admit of a serious consideration.

^a *Lister* is singular in his opinion, and thinks that the chief seat of this disorder is in the Stomach, and small Intestines : *At primaria hujus morbi sedes est Stomachus, & Intestina tenuia* : But if these parts of the body were principally affected, a *Lientery*, or a *Diarrhœa* rather than a *Diabetes*, would surely be produc'd.

Dr. Willis, that great Physician of his time, observes, that Rhenish Wine, Cyder, and acid liquors being drank provoke a more plentiful *Diuresis* or evacuation by Urine : The cause of this evacuation he attributes to a fusion

^a *Exercit. de Diabete* p. 65.

or melting of the blood into ferofities by fuch acid liquors; fo that the Crafs or mixtion of the blood being diffolv'd, the watry parts cannot be contain'd by the more thick, but fliding from their embraces, and being imb'd with faline particles, do run through the moft open paffages of the Reins, and fo caufe a *Diabetes*. And he gives us an Inftance of one, who by uſing Rheniſh Wine for his ordinary drink twenty days together, contracted an incurable *Diabetes*, of which he dy'd within a month. But the *Diabetes* in this caſe, and when brought on by an immoderate drinking of fuch thin acid liquors does not ſeem to be owing to fuch a diffolution of the blood, as the Doctor intimates, but to the natural diſpoſition of fuch liquors to paſs off by Urine. The Secerning Veſſels of the kidney then muſt neceſſarily be overloaded by the great quantity of fluids, which they admit, and of courſe greatly relax'd, and hence a *Diabetes* will enſue, as will be ſhewn more particularly in its due place. For let the blood be in ever ſo diffolute and broken a ſtate, this Diſtemper will not be produc'd, unleſs there is a relaxation of the kidney in conjunction with it, but rather a dropſy, and for reaſons that have been already in-

insisted upon. An immoderate drinking then of acid liquors, and thin wines, by their quick and suddain passage through the kidneys will bring on a debility of these organical parts, widen their Secretory ducts, and in this manner produce a *Diabetes*; and such an excess of them seems to be the most frequent cause of it.

The account which ^aDr. *James Keil* gives of this disease comes next to be consider'd.

He asserts “that the most evident cause of
 “this disease is an habitual drinking of strong
 “liquors; and that the more spirituous they
 “are, the sooner and more violently they bring
 “it. By such an habitual drinking of strong
 “liquors it comes to pass in process of time,
 “that the Serum, or thin part of the blood,
 “contains a large proportion of a spirituous
 “Fluid, or that part of the Serum, which
 “should be water, is for the greatest part
 “Spirit. Now the Salts of the Urine or blood
 “will not dissolve in a vinous spirit, that is,
 “the particles of which the salts consist, are
 “more strongly attracted by one another, than
 “they are by such a fluid, as by experiment

^a *Animal Secretion* p. 70.

“appears, and therefore the Quantity of Salts
 “in the blood will be daily increas’d, and cir-
 “culating through the Capillary Vessels must
 “irritate the fine fibres, and cause little pains
 “and twitchings all over the body, which, he
 “says, are the preceding Symptoms of this
 “disorder. But when the Serum is full of
 “these salts, the distance between them and
 “the Globules of the blood will be less, and
 “consequently they will attract the Globules of
 “the blood more strongly than the Globules
 “attract one another; And the Globules or
 “red part of the blood will be dissolv’d and
 “diffus’d through the Serum of the blood.
 “And this again is confirm’d by experiments,
 “for nothing does render the red part of the
 “blood so fluid, and keeps it more from coa-
 “gulating when drawn into a cup, than U-
 “rinous Salts and Spirits. When the red part
 “of the blood is thus dissolv’d, and united to
 “its Serum, it will with the Serum be carried
 “off through the Glands of the kidneys, and
 “being united to their Salts, will alter their
 “Figures, and Properties, as Litharge and Co-
 “ral do the Salts of Vinegar, giving them a
 “sweet taste”

In this account of the *Diabetes* there seems
 to be more ingenuity, than truth. That Spi-

rituous liquors when drank to excess may be productive of this disorder, will be shewn in the sequel of this dissertation; but that an habitual drinking of them is the most evident cause of it, is evidently not true. But granting such a dissolution of the red part of the blood, as the Dr. imagines, which may be possible, but does by no means seem probable, there is no reason assign'd, why it should with its Serum be carried off through the Glands of the kidney. The objections which have been already made, occur here.

Proceed we now to the opinion of the celebrated ^a Dr. Mead, which demands our attention as well for its singularity, as for the eminent Character of its Author. “The *Dia-*
 “*betes*, he says, is not as Physicians have com-
 “monly judg'd, a distemper of the *Kidneys*,
 “but of the *Liver*, proceeding likewise from
 “a vitiated mixture of the bile. It most fre-
 “quently happens to those, who without due
 “exercise indulge themselves in drinking vi-
 “nous liquors, and then quench their thirst
 “arising from these, by too great a quantity
 “of such as are cooling.

“By such ill-timed heating, and cooling of

^a In the new Edit. of his book on poisons p. 32.

“the humours of the body, the natural pro-
 “portion of Salt in the bile, by which its
 “oily part is incorporated with the water,
 “is not sufficient, now the water over-a-
 “bounds, to preserve the mixture: So that
 “a great portion of this, together with some
 “of the thinnest of the oil will be discharg’d
 “by the kidneys; and the Urinary Ducts will
 “be greatly enlarg’d by a constant afflux that
 “way. By which means the thicker oily par-
 “ticles are left in a degree of coagulation in
 “the smaller tubes of the Liver, and are there
 “form’d into a hard fatty substance.

“The dissection of those, who have died of
 “the *Diabetes*, proves this to be so: For I
 “have always found a *steatomatous* collection
 “in their Liver, in appearance not unlike to
 “what is often discharg’d by stools in a con-
 “firm’d jaundice, but of a harder consistence.”

In the first place let it be here observ’d,
 that the texture of the ^akidney is so very
 close and compact, that in its natural state,
 before it has suffer’d any kind of violence,
 it will not admit any oily substance whatever,
 unless it be highly attenuated, and thorough-
 ly incorporated in a proper vehicle. A Pre-

^a v. Boerhaave’s acad. Lect. V. 3. p. 110.

ternatural dilatation of the kidney must be *prior* to its admittance of any fluid, that is more gross than the Urine. It does not then seem probable, that even this thinnest oil in such circumstances, when the mixture is destroy'd, can be admitted to pass through the kidney. Beside, such a disposition of the liver, as is here suppos'd, and such a vitiated mixture of the bile must necessarily be attended with a high *jaundice*, but as the *Diabetes* often appears without the least icterical Symptom, it seems necessarily to follow, that the liver is not the Seat of the *Diabetes*.

The ingenious Dr. *Randolph* in his treatise upon the Medicinal Virtues of the *Bristol Water*, after having made some just observations upon these accounts of it last mention'd, gives us his opinion of it, and is inclin'd to think the kidneys the Seat of this disorder, tho' he owns, that the great alteration made in the Urine seems very much to favour the opinion of a fault in the fluids; for if the kidneys, says he, were only in fault, why should Diabetical Urine differ so much from that which is natural, not only in *Quantity*, but in *Quality* also? But the reason of this alteration will evidently appear by prosecuting the enquiry farther, than seems to have been consistent

sistent with his design ; and in order to proceed more methodically ;

I shall first describe a *Diabetes* by pointing out the several Symptoms of it.

2dly, shew how a relaxation of the *Secretory* Ducts of the kidneys with a broken state of the blood, which may be *prior* to such a relaxation, must necessarily be the cause of such Symptoms, and when not, will be the consequence of it.

A Person then is known to labour under a *Diabetes* by the following Symptoms, to wit ; a copious and frequent discharge of pale-colour'd Urine ; the taste of which is sweet ; the Quantity evacuated exceeds in proportion the Quantity of liquors taken in ; it is found to acquire a ropy consistence by being expos'd for some time to the air ; as a consequence of this discharge, a hec tick fever, loss of flesh, great thirst, a sense of weakness about the Loyns ; and if *constitutional*, or too far advanced by a neglect of proper remedies, the Person so affected in reality dies of a consumption. These are then the most remarkable Symptoms of a *Diabetes*, and the known consequences of it.

I am in the next place to shew how a relaxation of the *Secretory* Ducts of the kidneys

nies with a dissolute broken blood must necessarily be productive of these Symptoms. But here it will be proper first to point out the causes, by which such a relaxation may be brought on.

And here let it be remark'd, that whenever a Gland is in a state of relaxation it will not duly perform its respective office.

It is well known, that whatever stretches out an animal fibre beyond its due degree of distension, and keeps it for some time so distended, will weaken the contractive spring of that fibre.

Now the Glands may be relax'd, or their contractive spring weakn'd, by several different means; as first, by being prest upon with too great a quantity of fluids, and this may happen either from a stoppage of perspiration, or from a defect of Secretion in one Gland, which may be occasion'd by some obstruction form'd in the *Secretory* Ducts of that Gland, and is known to encrease the Secretion in another; because such an obstruction will in effect be the same as an actual increase of the fluids; a consequence of which will be encreas'd Secretions. It may also happen from the Critical discharges of acute fevers lodging their malignity on these parts; and from excesses of every kind falling on these parts,

parts ; and here it may be observ'd, that such excesses will chiefly affect those parts, which are by constitution the weakest, and the disorder produc'd will correspond with the nature and office of that organical part, which is affected.

The Glands may also be relax'd, and the crasis of the blood broke by *Mercurial Salivations*, by a long continu'd use of powerful *Deobstruent* Medicines, and the kidneys in particular by an improper use of such as are stil'd *Diuretick*.

An habitual drinking of Spirituous liquors will also bring on the same ill effects, and may in some circumstances be the cause of a *Diabetes*.

But to explain the reason of this. —

It appears from several^a experiments, that all strong liquors not only contract the small arteries, but also coagulate the fluids, which are contain'd in them. A consequence of these effects will be a stoppage of the *Secretions*, and if often produc'd, a relaxation of the fibres of the Stomach, and Intestines ; hence will arise a failure of digestion, and of course of nutrition. When these necessary offices

^a Dr. Hale's Hæmas. p. 124.

fail, the solids will soon become weak, and languid, and the blood poor and watry. The body then being brought to this deplorable state by such an abuse of them; if we suppose the prevailing weakness to be in the kidneys, which may happen to be the case either accidentally or constitutionally, it is easy to conceive, that a *Diabetes* will come on. *Opiates* are known to act in the same manner, and therefore will produce like effects.

As the kidneys then may be relax'd by any preternatural pressure, so it is easy to apprehend, how a long suppression of Urine, (be the cause of that suppression what it will,) should be productive of this disorder. Dr. ^a *Harris* gives us an instance of such a cause of it in a case, that fell under his own observation. After having prescrib'd several Medicines very unsuccessfully for his Patient, whose case was a total Suppression of Urine for five whole days; the following *Cataplasm* was order'd to be applied to the Umbilical Region of the Sick Person,

℞ *Sapon. Nigr.* ʒvj *Croc. Opt.* ʒss *Sal. Succini* gr. xv. F. *Cataplasma*. The day following all

^a Lib. 2. obs. 3.

the Urinary springs appear'd in a manner burst; and a *Diluvium* of sweet Urine came on, but was however soon stopt by the Assistance of *Rhubarb* chiefly: This Medicine was judg'd by reason of the warmth of it to be the best, that cou'd be adapted to the age of his Patient, who was seventy seven years old; and by reason of the astringency of it, to the nature of the disease; there being no reason to think, why it might not be of equal efficacy in a *Renal* flux, as well as an *Intestinal* one; seeing that the difference of the parts affected constituted the difference of the disorder; in which observation there seems to be a great deal of truth.

But to proceed — As a stone in the kidney by its great pressure or irritation will bring on a relaxation of its fibres, so it may be the cause of this distemper.

^a *Bonetus* gives us such an instance of it in one, who dying of a *Diabetes*, was dissected, and a stone found in the left kidney. *Ren sinister lapide obsessus est angulos habente obtusos ---- Lingua squallida, & horridula, æstus, & sitis, meiebat plus justo, urina plane aquea, sensim extabuit, Diabete interiit.*

^a Bonet. pract. anat. Tom. 2. lib. 3. sect. 26. obs. 5.

The bites of some kind of animals, particularly the ^a *Dipsas*, have been known to occasion this disorder. The venemous juice of which Animal, I presume, taken into the blood, and receiv'd by the kidney, will bring on a *mortification* of it, that is, a *resolution* or relaxation of its several component parts; and then it is easy to conceive, that a *Diabetes* will ensue: Tho' I am more inclin'd to think it brought on by the drinking a large quantity of cooling acid liquors in order to appease the intolerable thirst consequent on the bite of this *Reptile*.

Hypochondriacal complaints have sometimes been the Forerunners of this disease. The reason of this may easily be accounted for; because as such disorders generally proceed from a weakness of the Solids, so by supposing the predominant weakness to be in the kidneys, this disorder will necessarily be produc'd.

A *Sphacelated* tumour in the bladder, or whatever causes a relaxation of its *Sphincter*, will be attended with plentiful discharges of Urine. Hence some have imagin'd this dis-

^a A kind of serpent found in Libya

temper to be an *affection* of the ^a bladder, but very erroneously. For it is reasonable to think, that the flux of Urine in all such cases will be involuntary; which constitutes no part of this disorder, and therefore does not properly come under the denomination of a *Diabetes*.

The kidneys and their Secretory Ducts being relax'd (be the cause of that relaxation what it will) a general debility of body will come on. Such is the close dependance that the several organical parts of the humane body bear to each other, that if any one be in a diseased state the others will be affected by it. Every part of this complicated Machine must regularly discharge its respective office in order to preserve the harmony or health of the whole. In such a state of the body then as this, there can neither be a due combination of the several parts of the blood, nor a proper assimilation of the *Ingesta*. The consequences of which will be just now consider'd.

a Multis ementitus Diabetes: causam ad affectionem renum referebant: Mortuis contracta plane vesica reperta est cum gangræna & tumore σπαιλωδῆ in capacitæ ipsius vesicæ. Bonet. obs. 4. in. loc. prius cit.

Having

Having then enumerated the several causes by which the kidneys may be relax'd, and the crasis of the blood broke ; we proceed to shew how such a state of the body must necessarily bring on a *Diabetes*.

And here I shall beg leave to mention one disorder, which seems to be in most respects *analogous* to this, and that is, a lacteal *Diabetes*. The learned and judicious Dr. ^a *Boerhaave* gives us an instance of such a disease. "There was, he says, a certain Woman who dwelt at the City of *Dort*, who bore and suckled Children for twelve years successively ; but at length she fell into a lacteal *Diabetes*, in which all the nourishment that was taken ran through her Breasts without any suction, under the appearance of milk, insomuch that if she drank a pint of ale there was almost the like quantity of milk evacuated from her Breasts."

This instance then beautifully illustrates, and strongly confirms the Theory laid down.

But to proceed — The first Symptom, that I shall take notice of, by which a Person is known to labour under a *Diabetes* is the copious and frequent discharge of pale colour'd

^a *Boerhaave's Acad. Lect. V. 3. p. 143.*

Urine. That this is an effect necessarily arising from such a state of the body will evidently appear from a little consideration. The *Secretory Ducts* of the kidneys being in this relax'd morbid state, they will readily admit those humours, which in a natural state by reason of the compactness of their texture, they would by no means give admittance to; and consequently the discharge must be proportionably great. The little stay the Secreted humours make in the body will be the cause of their undergoing but a little change as to their colour and rancidity: Seeing that the colour and rancid smell of the Urine, when evacuated in a healthy state of the body, are owing most probably to its long retention in it; for by such a retention its oily parts become putrid, and will of course put on a different complexion. *Diabetical Urine* then is somewhat of a Chylous nature, and as all the *nutritious* juices are of a tenacious viscid disposition, so they readily coagulate, when expos'd to the Atmosphere; and to this seems to be owing the reason of its ropy consistence.

That the quantity evacuated should exceed in proportion the quantity of liquors taken in, appears from what has been already observed

serv'd; for in this weakn'd state of the kidneys, and broken condition of the blood, a great portion of those juices, which should be retain'd in the body for its nourishment, will be admitted to pass through the kidneys, and of course be thrown out of it, as tho' excrementitious; to which may be added the actual increase of fluids arising from a general waste of the Solids, which the kidneys being now enlarg'd will greedily receive. No wonder then, that the quantity evacuated should exceed in proportion the quantity of liquors taken in. A necessary consequence of such a discharge, (and because in such circumstances the important office of Nutrition is in a manner suspended,) will be loss of flesh, and a great waste of the body, which is always observable, when this disorder is far advanc'd, and the Patient almost brought by it to a period of his days; and it frequently happens in this last stage of it that even solid pieces of flesh are brought away with the Urine.

The sense of weakness about the Loyns must be owing partly to this relaxation of the kidneys, and partly to the evacuation made; for in all drains whatever those parts of the body sustain the greatest loss of fluids, which are nearest to that part, from which the drain
is

is made, and will consequently be sensible of a proportionably greater weakness. The same complaint is made in other fluxes, in a *gonorrhæa* by Men, and the *fluor albus* by Women; and the reason of it in both cases is the same.

The Symptom that comes next to be accounted for is the sweetness of the Urine.

As a different configuration of the particles of the same body is well known to impress on the nervous *Papillæ* of the Tongue different sensations; We conclude, and I think, very reasonably, that the difference of the tastes of bodies is owing to some different texture of their particles; but, as I apprehend, it is no very easy matter to determine *absolutely* what particular disposition or combination of the several parts, of which all bodies are known to consist, is necessary to make a body either *sweet* or *bitter*; so till this can be ascertain'd, we must be contented with this general account of the sweetness of diabetical Urine; that it is owing to some different texture of its several heterogeneous parts.

Animal substances when putrefied give a fætid taste, and the reason of this is ascrib'd not only to their natural disposition to give such a taste; but also to some different modification

dification of their parts acquir'd in the Process of Putrefaction. *Chemistry* teaches us, that all bodies are compos'd of the same Elements, *Fire, Air, Water, Earth, Salt, and Oil*; and therefore the variety of their colour, smell, taste, and the like, must be owing primarily to some different disposition of these Elements. We learn indeed from observation, that the nearer the parts of any body approach to a sphærical disposition; the more mild and soft is the taste of that body; and that the farther they recede from such a disposition, the more acrid, and rough is the sensation, that such bodies excite in us.

That the tastes of bodies do depend upon a different combination of their particles is a truth not to be disputed.

Mercury in its sphærical figure is both innocent, and tasteless, but when sublim'd, it loses its sphæricity, and becomes acrid, corrosive, and poisonous.

An intire mass of ^a *Silver* is insipid, but by being dissolv'd in *aqua fortis*, and shooting into Chrystalls, it becomes bitter; *Lead* ano-

^a See Mr. Boyle's Mechanical production of tastes.

ther tasteless body dissolv'd in the same Menstruum makes the *solution* sweet.

A mixture of Spirit of Nitre, and rectified Spirit of Wine, the former highly corrosive, the latter very pungent, composes a body of an agreeable taste.

It appears then from experiments, that a different disposition of the particles of bodies is the cause of that variety of tastes, which is observable in bodies, and that it will also excite tastes in those bodies, which before were insipid.

We have hitherto accounted for the sweetness of diabetical Urine, upon no other principles, than the original and primary cause of the difference of the tastes of natural bodies in general; and into this indeed must all other accounts of it be at last resolv'd: For could we know the various mixtures the Urine may possibly undergoe in this state of the body; yet we should still be at a loss to give a reason for the alterations arising from such mixtures.

But to be more particular — It is known from observation, that the *Ingesta* of what kind soever, after they have been prepar'd and elaborated fine enough by the digestive

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or.

organs to enter the *Lacteals*, are ^a sweet to the taste. The milk, which the Infant sucks from the Breasts of the Mother, is sweet; and even the blood itself is *relatively* sweet. It has been already observ'd that a long retention of the humours in the body is the sole cause of the rancidity of them; and it has been also shewn that in a *Diabetes*, part of those juices, which should be retain'd in the body for its nutrition, is thrown out of it, as tho' excrementitious; so that the Urine in this disease is somewhat of a Chylous nature, and as the salt of Chyle or milk is sweet, so the taste of the Urine must also be sweet; seeing that it has not been long enough circulating in the Vessels to acquire any degree either of rankness or Acrimony. This Chylous nature then of the Urine with a different combination of its several parts will easily account for its remarkable sweetness.

That a *Diabetes* should be attended with a hectick fever will appear evident from a consideration of the known causes of it. But it would be foreign to my purpose to run through all the causes, by which this kind of fever is produc'd, and to shew how necessarily a ca-

^a v. Boerhaave's Acad. Lect. V. 2. p. 48.

chectical body must produce a Hectick. A very common cause of it however is an acrimony in the blood, whether it be of the *acid* or *alkaline* kind, which by irritating and fretting the Solids will accelerate the circulation of the blood, in the accelerated course of which is fixt the Idea of a fever. The same irritation will happen from an *absorption* of *Pus* in case of an inward Ulcer. But whether or no there is such an *absorption* of *Pus* is at present a disputed point: Tho', I think, there is all the reason, that can be desir'd, to resolve it in the affirmative; and chiefly because of that true *purulent* matter, with which the *fæces* in ulcerated cases are sometimes known to be tinctur'd, even when there has been no Ulcer in these parts, and therefore could not possibly have been evacuated by *stool*; had it not been first absorb'd into the blood. That there are Vessels in the humane body capable of such *absorption* is granted by every one; That *Pestilential* and other noxious *effluvia* are absorb'd by them, and communicated to the blood, is often verified by fatal experience; That the drops of blood, which gush out from the rupture of a small artery, are also absorb'd into the mass of blood, every day's experience proves. As it is clear
 then

then beyond all possible doubt, that there is such an absorption of fluids into the blood, I can see no reason, why the *Pus*, which is discharg'd from an Ulcer, may not also be absorb'd.

That a great loss of blood will also bring on a Hæctick, whether occasion'd by *Hæmorrhoidal*, or *Dysenterical* fluxes, too plentiful *Phlebotomy*, or the like, appears from observation, and is confirm'd by experiment.

The accurate and ingenious^a Dr. *Hales* observ'd, that the pulse of a horse, upon which he was going to make an experiment, "beat
"forty strokes in a minute, before he was disturb'd or tied down. But when the Glass
"tube was fixt to the left Crural Artery, it
"beat fixty five in a minute. And as the horse
"grew fainter by the loss of blood, the pulse
"was more and more accelerated, so as to
"beat an hundred times or more in a minute: Whence we see, that the pulse is weak
"and quick, when the heart is supplied with
"little blood; which is the case in the
"Hæctick fevers."

But to explain the reason of the hæctick, when brought on by any great evacuation more fully.

^a Hæmas. v. 2. Exper. 2. p. 12.

It is well known, that the Velocity, with which all fluids move through all known Vessels, is reciprocal to the resistance, which they meet with in their passage through such Vessels. Now this resistance among other causes of it will be increas'd or diminish'd in proportion to the Quantity of fluids contain'd in these Vessels; for the greater the Quantity of fluids is contain'd for instance in those Conical Vessels the arteries; the greater degree of force will be requir'd in the blood thrown out of the Heart to drive forward that already in the arteries; and there will also be in such circumstances a greater degree of friction; the Quantity of blood then being diminish'd, these resistances, which are known to retard its progressive motion, will be proportionably remov'd; as the motion of the blood then will now be more free, it will consequently be more quick; and as a quick circulation will cause a quick pulse; and as the pulse is denominated to be either strong or weak in proportion to the greater or less distension of the artery, which depends upon the Quantity or density of the blood; so we may easily collect the reasons from these known facts both of the weakness and quickness of the pulse in Hectick Fevers; and *how* Preternatural

ral fluxes of any kind are necessarily productive of a Hectick. From a diminution of the fluids, or from a relaxation, or dilatation of the Glands, (in which circumstances the Quantity of blood may be suppos'd to be diminish'd,) Dr. *Cheyne* in his *new Theory* of Fevers, has very ingeniously, and fully demonstrated all the *Phænomena* of Hectick Fevers. Thus then we come to a reason of the Hectick in a *Diabetes*; (viz.) the relaxation of the kidney, and the great evacuation made from it.

The great thirst, which is the last Symptom, that remains to be insisted upon, is owing partly to this inward fever, and partly to the great drain; for in such a case the *fauces* will become dry and rough; the dryness and roughness of which will excite in us that uneasy sensation, which we call, Thirst.

I have now gone through what I intended to insist upon, and hope, that the observations made, tho' rudely digested, will serve to throw some light into the nature of this disorder, and into the reasons of the several *Phænomena* of it. The Symptoms indeed seem to flow necessarily from the causes assign'd, which is an argument in their favour.

But as the cure of a disease is of far greater concern to mankind, than the *Rationale* of it;

it; tho' this should be first known to the skilful Physician, that he may the more effectually proceed to the removal of it; it may not be improper briefly to point out the Indications of cure, which arise from the account given of it. But I shall content myself by observing in general, that Medicines of a mild, Balsamick, compacting nature, seem to claim the first place: As they will be well adapted to agglutinate the fluids, and will moderately strengthen the weakn'd part. It is however often found necessary to make use of Medicines of a more astringent nature. If the weakness or relaxation of the kidney arises from an acrimony in the blood, that acrimony is first to be corrected by proper remedies. The greatest regard should be had in the cure of this, as well as all other Chronical diseases to a proper *Diet*, which in this case should undoubtedly be that of the *incrasating* kind. A good *Regimen* of the Non-Naturals has been known to eradicate the most stubborn distempers, when Medicines of great efficacy have fail'd: Nor is this at all strange; for seeing that most Chronical disorders are owing to some bad disposition of the blood, and the blood is made from what is taken into the body by way of food; a proper *Regimen*

men in such cases must surely be the best, as well as the most natural *Alterative*.

That the *Bristol Water* is of remarkable service in this disorder, Experience abundantly testifies. But the reason of its operation does not seem to be clearly understood; neither shall I take upon me to give any account of it; seeing that this is to be learnt only from knowing its Ingredients; and these are to be found out only by Chemical experiments, which are best made on the spot: And the late accurate *Enquirer* into its Medicinal Virtues intends to insist upon this point in the remaining part of his work. But as it is well known to cool the body, to thicken broken fluids, and to strengthen in some degree; so it seems to be well calculated to answer all the Intentions of *Cure* in this disorder.

I shall only offer one word more in order to prevent any objection, that may possibly be rais'd to this manner of enquiring into the nature of the diseases of the humane body.

And here let it be remember'd, that the first improvement, which the Science of Medicine receiv'd, was made by Reasoning upon Mathematical Principles. This then pav'd the way for those great discoveries, which have lately been made in the nature of the *Animal*

Oeconomy by the assistance of Mechanical observations. “ Nor could malice itself (as Dr. Mead expresses himself on the like occasion) deny this, were not ignorance in confederacy with it, which will secure any one from being benefitted by the most useful Demonstration.” And that this is not only the most likely, but is without all possible doubt, the only certain method of improving Physical Knowledge, is evident from the structure of the humane body. For it appears by Anatomy to consist of Solids and Fluids, both which are subject to the known Laws of *Matter* and *Motion*, and therefore the various disorders, to which this wonderful Fabric is hourly liable, can no way be more rationally accounted for, than by Mechanical Reasonings, and the application of these Laws to such alterations, as are observable in it.

This method then of enquiring into the nature of the diseases of the humane body, when it can be made use of, is the only certain one; I say, when it can be made use of; for there are some disorders of so complicated a nature, others again of so peculiar a one, that they are not capable of being consider'd in this ad-

4 Dr. Mead's preface to his book on Poisons.

vantageous Light; or of being reduc'd to any known Principles, whereon to found our enquiry. All that can possibly be done in such unhappy cases is to be effected by a careful observation of the Symptoms produc'd, by a diligent attention to the efforts, which Nature endeavours to make for her own relief, and by assisting her in the struggle by a due application of proper Remedies.

“It is past doubt with me, says ^a Dr. *Wainwright*, whatever some Physicians say against *Theory*, which they don't understand, that 'tis not only useful, but a necessary Qualification of a good Physician. For one that understands the structure of a Humane Body, the nature of the Solids and Fluids, the manner how animal actions are perform'd, the Nature of *Secretion*, the effect of either encreasing or lessening any evacuation, the known Laws of Motion as apply'd to *Mechanicks*, and *Hydrostaticks*, with the application of them to the alterations made in Humane Bodies, is *Cæteris paribus* better qualified for a Physician, than one who is ignorant of these things.”

^a In his account of the Non-Naturals p. 168.



